**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

In re Patent Application of

**HASEGAWA et al** Atty. Ref.: **1417-370**

Serial No. **Unknown** Group:

Filed: **November 26, 2001** Examiner:

For: **APPARATUS AND METHOD FOR PRODUCING CARBON BLACK, AND FURNACE COMBUSTION APPARATUS AND FURNACE COMBUSTION METHOD**

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**November 26, 2001**

Assistant Commissioner for Patents
Washington, DC 20231

Sir:

**PRELIMINARY AMENDMENT**

Prior to calculation of the filing fee and in order to place the above identified application in better condition for examination, please amend the claims as follows:

**IN THE CLAIMS**

Please substitute the following amended claims for corresponding claims previously presented. A copy of the amended claims showing current revisions is attached.

3. (Amended) A carbon black producing apparatus according to Claim 1 having an additional fuel feed port in each of the oxygen-containing gas feed ports.

4. (Amended) A carbon black producing apparatus according to Claim 1, wherein the shape of the oxygen-containing feed port opened into the reactor is non-circular.

5. (Amended) A carbon black producing apparatus according to Claim 1, wherein the shape of the oxygen-containing gas feed port is circular, and the opening diameter (Da) of the oxygen-containing gas feed port and the shortest distance (Dw) between the oxygen-containing gas feed port and the inner wall of the reactor have a relation of $Dw<1.5Da$.

6. (Amended) A carbon black producing apparatus according to Claim 1, wherein the shape of the oxygen-containing gas feed port is non-circular, and the opening diameter (DL) of the oxygen-containing gas feed port and the shortest distance (Dw) between the oxygen-containing gas feed port and the inner wall of the reactor have a relation of $Dw<1.5DL$.

7. (Amended) A carbon black producing apparatus according to Claim 1, wherein the distance from the crossing point of the center line of the fuel flow supplied from the fuel feed port and the center line of the oxygen-containing gas flow supplied from the oxygen-containing gas feed port to the end of the oxygen-containing gas feed port is not less than twice the opening diameter of the oxygen-containing gas feed port.

8. (Amended) A method of producing carbon black comprising using a producing apparatus as defined in Claim 1.

10. (Amended) A method of producing carbon black according to Claim 8, wherein the average temperature of the first reaction zone is not lower than 1,600°C.

11. (Amended) A method of producing carbon black according to Claim 8, wherein the combustion gas flow temperature in the vicinity of the feedstock hydrocarbon feed port is not lower than 1,600°C.

12. (Amended) A method of producing carbon black according to Claim 8, wherein the oxygen concentration in the vicinity of the feedstock hydrocarbon feed port is not more than 3%.

15. (Amended) A method of producing carbon black according to Claim 13, wherein the combustion gas temperature in the vicinity of the feedstock hydrocarbon feed port is not lower than 1,600°C.

16. (Amended) A method of producing carbon black according to Claim 13, wherein the oxygen concentration in the vicinity of the feedstock hydrocarbon feed port is not more than 3%.

19. (Amended) A method of producing carbon black according to Claim 17, wherein the reactor wall surface in the first reaction zone is under an oxidizing atmosphere.

20. (Amended) A method of producing carbon black according to Claim 17, wherein the average temperature of the first reaction zone is not lower than 1,600°C.

21. (Amended) A method of producing carbon black according to Claim 17, wherein the oxygen concentration in the vicinity of the feedstock hydrocarbon feed ports is not more than 3%.

24. (Amended) A furnace combustion apparatus according to Claim 22, wherein the distance from the crossing point of the fuel flow and oxygen-containing gas flow to the end of the fuel feed port is not less than 30 times the opening diameter of the fuel feed port.

25. (Amended) A furnace combustion apparatus according to Claim 22, wherein at least part of the furnace inner wall is made of magnesia- or micromagnesia-based refractory material.

26. (Amended) A furnace combustion method comprising using a furnace combustion apparatus as defined in Claim 22.

29. A furnace combustion method according to Claim 26, wherein the inner wall surface of the combustion furnace is under an oxidizing atmosphere.

## REMARKS

Attached hereto is a marked-up version of the changes made to the claims by the current amendment. The attached page is captioned "**Version with markings to show changes made**."

The above amendments are made to place the claims in a more traditional format.

Respectfully submitted,

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## VERSION WITH MARKINGS TO SHOW CHANGES MADE

3. (Amended) A carbon black producing apparatus according to Claim 1 [or 2] having an additional fuel feed port in each of the oxygen-containing gas feed ports.

4. (Amended) A carbon black producing apparatus according to [any one of Claims 1 to 3] Claim 1, wherein the shape of the oxygen-containing feed port opened into the reactor is non-circular.

5. (Amended) A carbon black producing apparatus according to [any one of Claims 1 to 4] Claim 1, wherein the shape of the oxygen-containing gas feed port is circular, and the opening diameter (Da) of the oxygen-containing gas feed port and the shortest distance (Dw) between the oxygen-containing gas feed port and the inner wall of the reactor have a relation of $Dw<1.5Da$.

6. (Amended) A carbon black producing apparatus according to [any one of Claims 1 to 4] Claim 1, wherein the shape of the oxygen-containing gas feed port is non-circular, and the opening diameter (DL) of the oxygen-containing gas feed port and the shortest distance (Dw) between the oxygen-containing gas feed port and the inner wall of the reactor have a relation of $Dw<1.5DL$.

7. (Amended) A carbon black producing apparatus according to [any one of Claims 1 to 6] Claim 1, wherein the distance from the crossing point of the center line of

the fuel flow supplied from the fuel feed port and the center line of the oxygen-containing gas flow supplied from the oxygen-containing gas feed port to the end of the oxygen-containing gas feed port is not less than twice the opening diameter of the oxygen-containing gas feed port.

8. (Amended) A method of producing carbon black comprising using a producing apparatus as defined in [any one of Claims 1 to 7] Claim 1.

10. (Amended) A method of producing carbon black according to Claim 8 [or 9], wherein the average temperature of the first reaction zone is not lower than 1,600°C.

11. (Amended) A method of producing carbon black according to [any one of Claims 8 to 10] Claim 8, wherein the combustion gas flow temperature in the vicinity of the feedstock hydrocarbon feed port is not lower than 1,600°C.

12. (Amended) A method of producing carbon black according to [any one of Claims 8 to 11] Claim 8, wherein the oxygen concentration in the vicinity of the feedstock hydrocarbon feed port is not more than 3%.

15. (Amended) A method of producing carbon black according to Claim 13 [or 14], wherein the combustion gas temperature in the vicinity of the feedstock hydrocarbon feed port is not lower than 1,600°C.

16. (Amended) A method of producing carbon black according to [any one of Claims 13 to 15] Claim 13, wherein the oxygen concentration in the vicinity of the feedstock hydrocarbon feed port is not more than 3%.

19. (Amended) A method of producing carbon black according to Claim 17 [or 18], wherein the reactor wall surface in the first reaction zone is under an oxidizing atmosphere.

20. (Amended) A method of producing carbon black according to [any one of Claims 17 to 19] Claim 17, wherein the average temperature of the first reaction zone is not lower than 1,600°C.

21. (Amended) A method of producing carbon black according to [any one of Claims 17 to 20] Claim 17, wherein the oxygen concentration in the vicinity of the feedstock hydrocarbon feed ports is not more than 3%.

24. (Amended) A furnace combustion apparatus according to Claim 22 [or 23], wherein the distance from the crossing point of the fuel flow and oxygen-containing gas flow to the end of the fuel feed port is not less than 30 times the opening diameter of the fuel feed port.

25. (Amended) A furnace combustion apparatus according to [any one of Claims 22 to 24] Claim 22, wherein at least part of the furnace inner wall is made of magnesia- or micromagnesia-based refractory material.

26. (Amended) A furnace combustion method comprising using a furnace combustion apparatus as defined in [any one of Claims 22 to 25] Claim 22.

29. A furnace combustion method according to [any one of Claims 26 to 28] Claim 26, wherein the inner wall surface of the combustion furnace is under an oxidizing atmosphere.